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ABSTRACT

Final course grade expectations of students in two models of instruction (mastery and nonmastery) were investigated. The intent of the study was to examine expectations between groups and to analyze within-mastery effects on self-perception of performance. Using preinstruction grade expectation, postinstruction grade expectation, Grade Point Average (GPA), and number of formative exams taken as independent variables and final exam scores as the criterion, relationships were obtained through stepwise multiple correlation analysis. Results support the validity of the feedback mechanisms within the mastery strategy in relation to a more accurate self-assessment of knowledge level and expected grade from pre- to postinstruction. (Author)

Grade Expectations Within a Mastery Learning Strategy

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Introduction

The present authors have investigated cognitive and affective student outcomes of an implementation of a mastery learning model (Glasnapp, Poggio, & Ory, 1975; Poggio, Glasnapp & Ory, 1975; Glasnapp, Poggio, & Deaton, 1976). Further data collected from this two year implementation addresses the validity of components of the mastery model. The present study examines final grade expectations and performance of students in three models of instruction (two of which were based on modification of a mastery model approach). The intent of the study was to examine expectation differences between models and to analyze within-mastery effects of self-perceptions of performance.

Students evaluated under a norm-referenced grading system (non-mastery) have years of experience in somewhat similar circumstances to draw upon when asked to predict their end-of-course grade. Repeated and consistent indicators of academic success and/or failure should produce a rather realistic outlook of expected final grade. However, students experiencing a mastery learning strategy (Bloom, 1968) characterized by a summative criterion-referenced grading system are aware of their performance level if and only if they have been taking formative examinations. Success on items within the formative exams indicate mastery of course objectives while those items failed indicate specific objectives not yet attained. The process of taking formative exams is similar to that of a branching sequence in programmed instruction with the greater the number of formative exams taken, the greater the amount of feedback/reinforcement related to the attainment of course content and the wider the information base for grade prediction.

The mastery model would seem to suggest that (a) students under a norm-referenced model (non-mastery) should be more accurate in predicted final

knowledge level attainment prior to the final exam than students in a criterion based mastery approach due to past experience and summative midterm grades; (b) students within the mastery model should become more realistic (more accurate in predicting final grade) as the course proceeds if they have taken advantage of formative exams; and (c) the greater the number of formative exams taken, the more accurate the student will be in predicting final grade.

Method

During two semesters, two sections of an undergraduate measurement course were offered concurrently at least three different times during the day. Students were allowed to enroll in either section at a given time period, but were randomly reassigned to one of the two sections offered at the same time on the first day of class. One section at each time period was randomly assigned to be taught using a mastery learning model (mastery A) and the other section used a traditional lecture-recitation instructional format. The sampling resulted in two randomly assigned groups of students receiving different instructional models at the same time of day for each of at least three periods during the day. All students and instructors used a common set of objectives and course outline, but the model used in teaching the objectives differed. Students in mastery A sections were allowed to take up to 11 formative examinations, with their final grade resting solely on the criterion-based final exam. Students in non-mastery sections were administered 3 exams prior to the final exam and their final grade was norm-referenced from the 4 standardized test scores.

To obtain background information and entering expectations, including predicted course grade, an information questionnaire was administered to all

students during the first class period. Prior to the final exam all students were again administered the questionnaire. Included on the final questionnaire was a predicted course grade inquiry. In total 114 students in mastery model A sections and 112 in non-mastery sections had complete data sets.

Data collected but not analyzed in a recent study of an implementation of a mastery learning strategy (Glasnapp, Poggio, & Deaton, 1976) provided an opportunity to further investigate the relationship of grade expectations within a mastery learning model (mastery B). In addition to the variables collected for the mastery A group, a mid-semester grade expectation was recorded. Since few students took more than the required one formative exam per unit, a new variable was created for the mastery B group to reflect the extent of full participation of the students in taking unit formative examinations. This dummy coded variable had a value of one if at least one formative examination per unit of instruction was taken and it had a value of zero if one or more of the four unit formative examinations were not completed. Complete data sets were obtained for 77 students in the mastery B sections.

Results

Separate stepwise multiple correlation analyses, one for each of the three groups, were obtained. Common independent variables for the equations were pre-insiruction expected grade, post-instruction expected grade, and entering grade point average (on a four-point scale). The mastery B group also included a mid-semester grade expectation as an independent variable. An additional variable, the number of formative exams taken during instruction, also was entered as an independent variable in the analysis for the mastery A group. The order in which the variables were entered into the

equation was predetermined and corresponded with the order of listing above. The cognitive final examination total score served as the criterion variable for all groups. Means and standard deviations for the variables used in the multiple regression analyses are shown, by group, in Table 1.

Insert Table 1 Here

Within the mastery A group, all four variables contributed significantly ($p < .05$) in accounting for final exam score variation. Table 2 summarizes the results of this stepwise multiple regression analysis. The beta weights for pre-expected grade, post-expected grade, GPA, and number of formative exams were .163, .335, .293, and .173, respectively. The resulting multiple R was .648. The entry of the last variable, number of formative exams taken, as a significant contributor beyond those variables already entered offers supporting evidence of the utility of formative exams in the mastery strategy. Results supporting the prediction that students should become more accurate in their grade expectations as instruction progresses was obtained. The post-instruction grade expectation was the single most significant predictor and contributed significantly beyond that of pre-instruction grade expectation. Additional support indicating that students became more realistic can be obtained from the partial correlation. The zero-order correlation between post-expected grade and the criterion was .507. When pre-expected grade is partialed from both variables, the correlation decreased to .452.

Insert Table 2 Here

For the non-mastery group the multiple correlation was not as high ($R = .346$) when the three common variables were entered. In the final multiple correlation equation, only post-expected grade and GPA had statistically significant ($p < .05$) beta weights. The results of the latter stepwise multiple regression analysis are summarized in Table 3.

Insert Table 3 Here

Table 4 summarizes the stepwise regression analysis for the mastery B group. Results supporting those reported for the mastery A group (Table 2) are found in the beta weights of Table 4. The most significant predictor of performance on the final examination was the post-instruction grade expectation. Entering grade point average and full participation in formative examinations also contributed significantly to the final multiple regression equation. The zero-order correlation of post-expected grade and the criterion was .393 but when pre-expected grade was partialed from both variables, the correlation is diminished to .369, replicating the findings of the mastery A group. Of interest is the suppressing effect of mid-semester grade expectation. If used in combination with the other variables, the mid-semester grade expectation enhances the overall prediction of the final examination score. Used alone, however, the mid-semester grade expectation does not relate to performance on the final examination.

Insert Table 4 Here

Discussion

Based upon mastery learning theory, feedback within the model (available from formative examination participation) should provide for a realistic self-assessment by students of their knowledge level. Given prespecified grade criteria as part of the criterion-referenced grading component in the model, students' grade expectations should become more accurate as instruction progresses. The data reported for the mastery A group supports this hypothesis. Rather than changing their behavior to attain the grade expected at entry into the course, students seem to modify (lower) their grade expectations during instruction to become more compatible with their performance on the final examination.

Differences in the structure of the two mastery groups confounds the interpretation of the results reported in this study. Mastery group A received instruction within a model that was different from the model used with mastery group B. In particular, group B received instruction based on more recent writings of Block (1974), Block and Tierney (1974). Students in mastery group B were given criteria for an A grade only. The criteria for grades of B, C, D, and F were not prespecified. In addition, mastery group B students were required to take one formative exam per unit of instruction. Alternate forms of unit formative exams were available but mastery B students did not take full advantage of this opportunity to take additional formative examinations.

The dependent variable used for all regression analyses was not directly comparable between the mastery groups and the traditional group. Students within the mastery groups were assigned course grades based solely upon their

performance on the final examination. However, students within the traditional group were assigned course grades based upon a weighted composite of four examination scores. In effect, the grades assigned to the traditional group were not directly related to performance on the final examination. An example may clarify this point: student X may have performed well above the mean on the three course examinations, student X would have realized that it would be possible to still receive, say an A even if his/her score on the final exam was just at or above the mean since the grade assigned was based upon a norm-referenced system.

These differences and their effects on the data of this study are evident from the intercorrelation matrices of the variables within each group. Table 5 lists the intercorrelations. Of primary salience is the change in the zero-order correlation between pre-instruction grade expected and post-instruction grade expected with performance on the final examination. Mastery group A evidenced the highest correlation of post-grade expected with final exam score ($r = .51$). This group received prespecified grading criteria. Mastery group B, however, were not informed of the grading criteria for grades other than an "A". As may have been expected, the relationship of post-expected grade and final exam score for this group would be lower ($r = .39$) than mastery group A since the students, not aware of the grading criteria, had no basis on which to make their grade predictions. Evidence for a less than maximum effort of the traditional group students is seen in the post-expected grade correlation with final exam score, $r = .27$. This last correlation coefficient is deflated since, as discussed above, performance on the final examination did not necessarily determine the grade assigned. Though

no guessing on the traditional group's part was needed to predict final grade assigned, the post-expected grade was not predictive of performance on the final examination.

Table 5C shows higher levels of correlation coefficients than Table 5A and 5B. This is probably due to the restricted variability in grade expectations for the latter groups since a five, not the nine point scale used for mastery B students, was used to record grade expectations.

Insert Table 5 Here

Educational Implications and Significance

The results of the present study, though confounded by methodological considerations, generally provide further support for the internal validity of selected components operating within a mastery learning instructional strategy.

The difficulties encountered in this study raise the question of comparability of studies focusing on mastery and traditional instructional strategies using performance on a final examination as a unit of comparison. Traditional or non-mastery designs of instruction typically use a composite, norm-referenced marking system in which final examination performance is not necessarily indicative of overall course performance. Mastery models, on the other hand, base overall course performance on the score attained on a final examination. To compare final examination scores of students in these two instructional strategies is not, as we may desire, a comparison of course performance in the two groups.

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Table 1

Means and Standard Deviations for the Variables Used in the Stepwise Regression Analysis

	Traditional Group (N = 112)		Mastery A Group (N = 114)		Mastery B Group (N = 77)	
Variable	Mean	S. D.	Mean	S.D.	Mean	S.D.
Grade Point Average	2.907	0.964	2.926	0.760	3.125	0.504
Pre-instruction Grade Expectation[a]	4.518	0.537	4.693	0.500	7.169	1.351
Mid-semester Grade Expectation					7.130	1.542
Post-instruction Grade Expectation	4.062	0.661	4.026	0.781	7.104	1.429
Number of Formative Examinations Taken			2.746	2.047		
Formative Examination Participation					0.909	0.289
Final Examination Score[b]	39.161	6.899	40.386	7.298	64.454	10.396

[a]Grade expectations were recorded on a five-point scale for the mastery A and traditional groups; a nine-point scale was used for the mastery B groups.

[b]Final examinations for the mastery A and traditional groups had a maximum value of 60; the mastery B group had a maximum value of 85.

Table 2

Summary of Stepwise Multiple Regression Analysis: Mastery A Group.

Dependent Variable = Final Examination Score (N = 114)

Variable	Multiple R	R^2	R^2 Increment	Simple R	Beta
Pre-instruction Grade Expectation	.3213	.1032	.1032	.3213	.1626*
Post-instruction Grade Expectation	.5352	.2864	.1832	.5075	.3346*
Grade Point Average	.6273	.3935	.1071	.4668	.2928*
Number of Formative Examinations Taken	.6479	.4198	.0263	.3525	.1730*

*p < .05

Table 3

Summary of Stepwise Multiple Regression Analysis: Traditional Group.

Dependent Variable = Final Examination Score (N = 112)

Variable	Multiple R	R^2	R^2 Increment	Simple R	Beta
Pre-instruction Grade Expectation	.1817	.0330	.0330	.1817	.0873
Post-Instruction Grade Expectation	.2879	.0829	.0499	.2663	.0276*
Grade Point Average	.3460	.1200	.0371	.2472	.1965*

*p < .05

Table 4

Summary of Stepwise Multiple Regression Analysis: Mastery B Group.

Dependent Variable = Final Examination Score (N = 77)

Variable	Multiple R	R^2	R^2 Increment	Simple R	Beta
Pre-instruction Grade Expectation	.1471	.0216	.0216	.1471	.0231
Mid-semester Grade Expectation	.1477	.0218	.0002	.0792	-.1600
Post-instruction Grade Expectation	.4205	.1768	.1550	.3927	.3358*
Grade Point Average	.4832	.2335	.0567	.3888	.3322*
Formative Examination Participation	.5323	.2833	.0498	.1364	.2309*

*$p < .05$

Table 5

Intercorrelations of Variables Within Each Group

A. Mastery A Group (N = 114)

	Pre-Expected Grade	Post-Expected Grade	GPA	Number of Formative Exams Taken	Final Examination Score
Pre-expected Grade	1.0000				
Post-expected Grade	.3155	1.0000			
GPA	.1401	.2849	1.0000		
Number of Formative Exams Taken	.0709	.2291	.3227	1.0000	
Final Examination Score	.3213	.5075	.4668	.3525	1.0000

B. Traditional Group (N = 112)

	Pre-Expected Grade	Post-Expected Grade	GPA	Final Examination Score
Pre-expected Grade	1.0000			
Post-expected Grade	.2887	1.0000		
GPA	.1756	.1702	1.0000	
Final Examination Score	.1817	.2663	.2472	1.0000

(continued)

Table 5

Intercorrelations of Variables Within Each Group

(continued)

C. Mastery B Group (N = 77)

	Pre-Expected Grade	Mid-semester Grade Expectation	Post Expected Grade	GPA	Formative Exam Participation	Final Examination Score
Pre-expected Grade	1.0000					
Mid-semester Grade Expectation	.4566	1.0000				
Post-expected Grade	.3179	.4895	1.0000			
GPA	.3610	.2567	.4351	1.0000		
Formative Exam Participation	-.1285	-.0912	-.0723	-.2462	1.0000	
Final Examination Score	.1471	.0792	.3927	.3888	.1364	1.0000